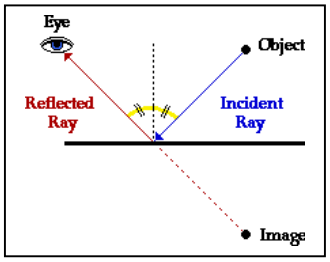
Activity #9

Title: The IR Challenge! –Student's Copy



Purpose:

- To prove that infrared energy can be reflected by mirrors in much the same way as visible light
- To infer that infrared energy is very similar to visible light in many respects and that both are components of the same electromagnetic spectrum.

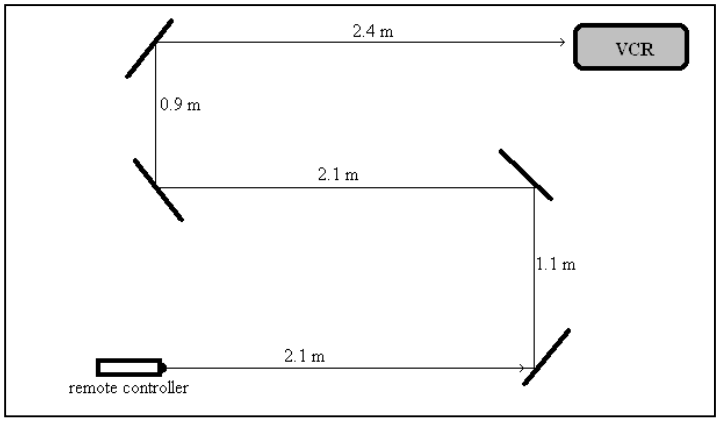
Materials: 4 flat, silvered mirrors (100mm x1000mm) per team, 4 mirror bases per team, 1 IR-controlled appliance/remote controller per team, 1 metric tape measure, two 6" squares of aluminum foil

The Challenge: Reflect the beam from an infrared controller off as many of the four mirrors as possible to turn on the appliance. Sound easy? Well, there's a slight "catch" here.

- Your team's score will be calculated by MULTIPLYING the **# of mirrors** used by the **total distance in meters** that the beam travels and then DIVIDING that answer by the **number of attempts** required to successfully complete the challenge…..according to the following formula:

$$\frac{\text{(\# of mirrors X distance in meters)}}{\text{\# of attempts}}$$

- There will also be a time limit of _____ minutes that your team will have to prepare its challenge project for the first test trial.
- Your team will have to submit a diagram of the mirror layout with each "leg" of the IR energy's trip labeled in meters…such as in the sample diagram below:



- Oh yes…one last item that has not been mentioned yet: You will NOT have access to the IR remote controller during the setting up of your mirror arrangement prior to testing!! That's right—it's all done with visible light (line of sight)!
- Hint #1: Fold your square of aluminum foil a few times so that it is approximately 2" x 2". Cover various areas of the front of your appliance while operating the POWER ON feature of your remote controller from a short distance away. Repeat this procedure after moving the folded aluminum foil to different areas until you locate the internal IR receiver. Now, when aligning

your mirrors for the challenge, zero in on this specific target area prior to your first (and hopefully ONLY) trial test!

- Hint #2: You MIGHT want to determine the maximum straight-line distance that your remote controller operates the appliance so that you don't arrange/space your mirrors to exceed that limit before the first trial test.

The accompanying answer sheet provides the necessary space for your diagrams and data to be recorded as well as two additional follow-up questions regarding observations made in this activity.